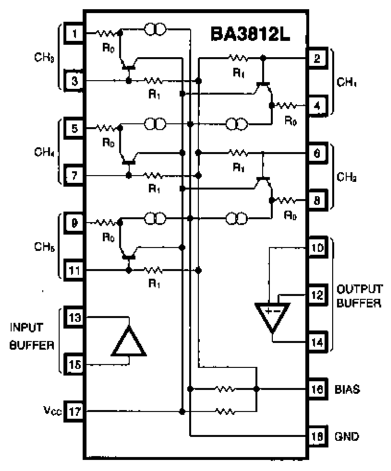
5-channel graphic equalizer
BA3812L

The BA3812L is a five-point graphic equalizer that has all the required functions integrated onto one IC. The IC is comprised of the five tone control circuits and input and output buffer amplifiers.
The BA3812L features low distortion, low noise, and wide dynamic range, and is an ideal choice for HiFi stereo applications. It also has a wide operating voltage range (3.5V to 16V), which means that it can be adapted for use with most types of stereo equipment.
The five center frequencies are independently set using external capacitors, and as the output stage buffer amplifier amplifier and tone control section are independent circuits, fine control over a part of the frequency bandwidth is possible, By using two BA3812Ls, it is possible to construct a 10-point graphic equalizer.
The amount of boost and cut can be set by external components.

●Applications
Radio cassette players, home stereo systems and car stereo systems.

●Features
1) Minimizes the number of components required to build a graphic equalizer.
2) Low distortion and low noise.
3) Wide supply voltage range (3.5V to 16V).
4) Low current consumption (5 mA).
5) Wide dynamic range (V_{OM} = 2.1V_{rms}/V_{CC} = 8V)
6) Built-in input and output buffer amplifiers.

●Block diagram



R_0=1.2kΩ
R_1=68kΩ

●Absolute maximum ratings (Ta = 25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	16	V
Power dissipation	Pd	550 *	mW
Operating temperature	Topr	−25~75	℃
Storage temperature	Tstg	−55~125	℃

* Reduced by 5.5 mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	3.5	8	16	V

●Electrical characteristics (Unless otherwise specified, Ta = 25℃, V_{CC} = 8V, and fin = 1kHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent circuit current	I_Q	2.5	5.0	8.0	mA	−
Maximum output voltage	V_{OM}	1.5	2.1	−	V	THD=1%
Total harmonic distortion	THD	−	0.01	0.1	%	V_{OUT}=120mV、f=1kHz
Output noise voltage	V_{NO}	−	5	20	μV	R_{IN}=10kΩ
Input/output gain	Gv	−2.5	−0.5	1.5	dB	Overall input/output gain when all flat V_{IN}=200mV
Control range	CR	±10	±12.0	±14	dB	V_{IN}=200mV

●Measurement circuit

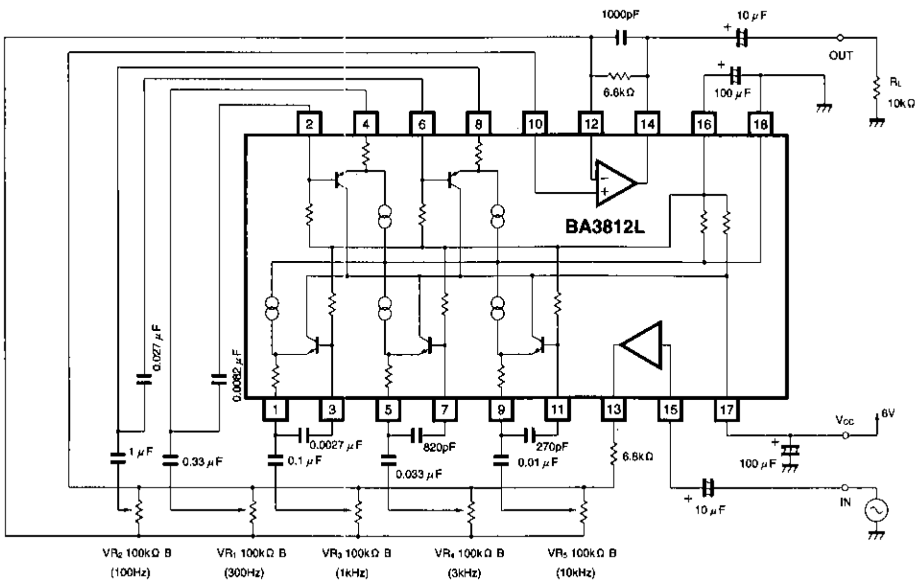


Fig. 1

● Application example

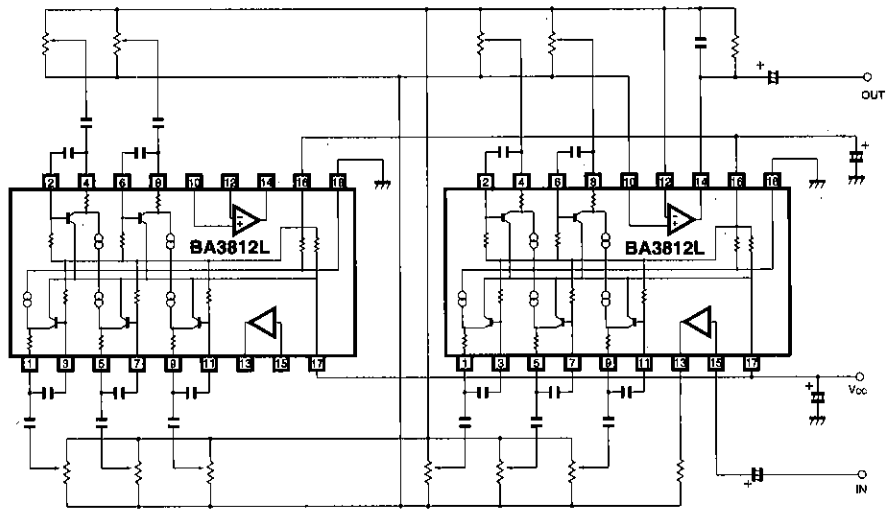


Fig. 2 10-point single channel graphic equalizer circuit

By using more than one IC the following applications are also possible :

(1) 10-point single-channel graphic equalizer

As shown in Fig. 2, with two ICs it is possible to construct a 10-point single-channel graphic equalizer,

(2) 7-point stereo graphic equalizer

As shown in Fig. 3, with three ICs it is possible to construct a 7-point stereo graphic equalizer. Two BA3812L ICs are used to construct a 5-point stereo graphic equalizer, and two of the active inductor circuits from a third BA3812L are added to each.

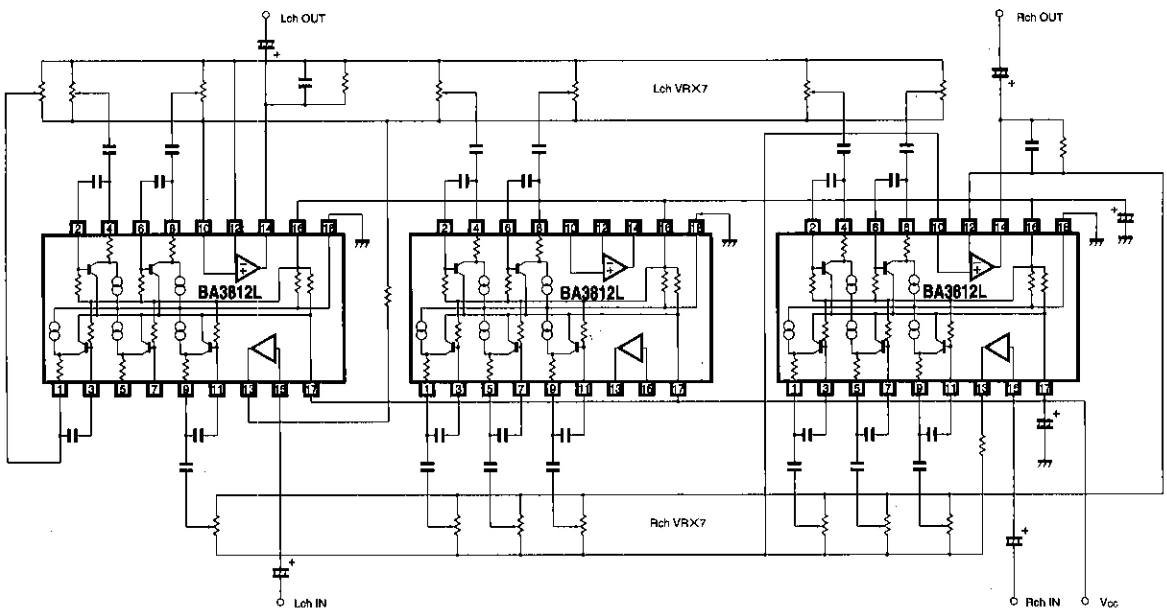


Fig. 3 7-point stereo graphic equalizer circuit

●Circuit operation

An active inductor is a solid-state circuit that has the equivalent function of an inductor, but is constructed from active components. The circuit shown in Fig. 4 is used in the BA3812L. This circuit employs two capacitors, a potentiometer, and a bypass capacitor as external components, everything else is on the chip.

The resonance frequency (f_0) and the Q of the circuit are fixed by the values of the external capacitors.

The circuit Q is obtained from the following formula :

$$Q = \sqrt{\frac{CR_1}{C_0 R_0}}$$

The resonance frequency is obtained from the following formula :

$$f_0\ (Hz) = \frac{1}{2\pi\sqrt{R_0 R_1 C C_0}} \quad (R : \Omega, C : F)$$

Q is the factor that determines the bandwidth of the frequency. If the amount of boost and cut are the same for the same resonance frequency, the larger the value of Q, the narrower the resonant frequency band.

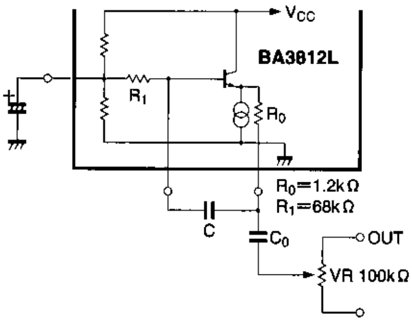


Fig. 4

●Electrical characteristic curves

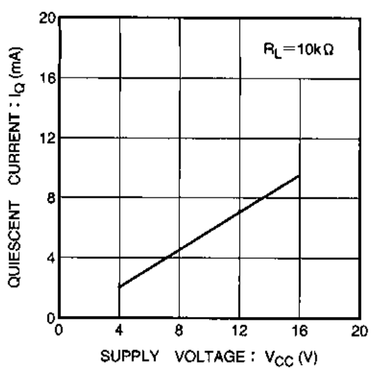


Fig. 5 Quiescent current vs. supply voltage

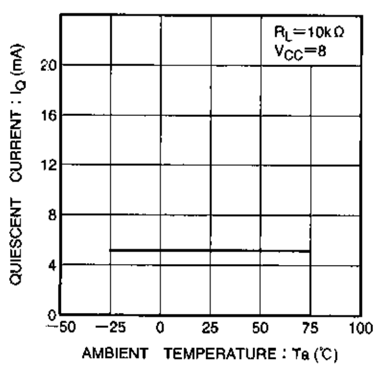


Fig. 6 Quiescent current vs. ambient temperature

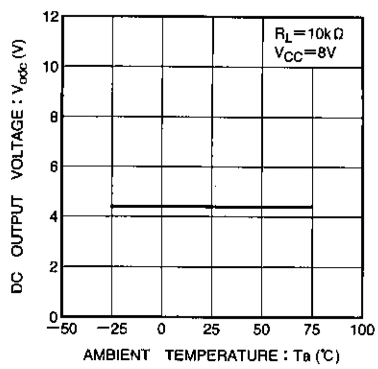


Fig. 7 DC output voltage vs. ambient temperature

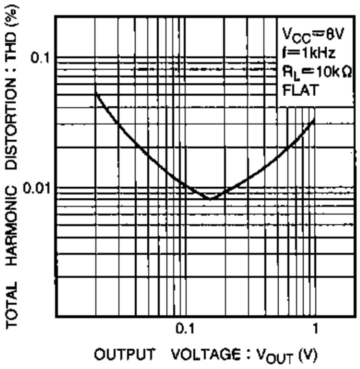


Fig. 8 Distortion vs. output voltage

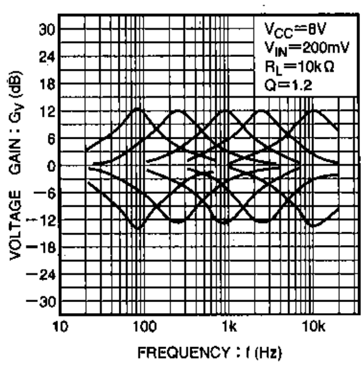
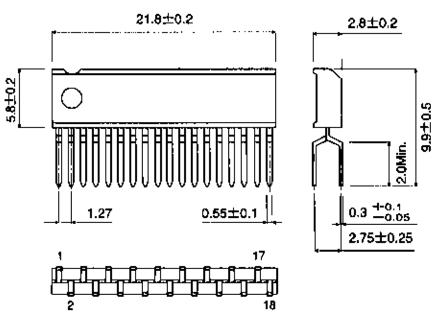


Fig. 9 Voltage gain vs. frequency

●External dimensions (Unit: mm)



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